Chemical & Engineering NEWS

NAS president Frank Press:
Science in the 80s Page 32

First news from the Las Vegas
ACS meeting

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National security concerns

Will they hobble science?

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April 5, 1982
Volume 60, Number 14
CENEAR 60 (14) 1–56
ISSN 0009-2347

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Polyvinyl chloride shakeout gains momentum

Some producers of this key thermoplastic want to get out now as market continues to soften, but buyers are becoming hard to find

One need hardly be told that the polyvinyl chloride market is in a shambles. Production and shipments are well off from what they were last summer, prices are down, and producers are actively seeking to leave the market. The only thing that is keeping producers from getting out is that, as with the product itself, nobody seems very willing to buy a PVC plant.

Production of PVC in December hit its lowest point in almost a year and a half, according to figures compiled by the accounting firm of Ernst & Whinney for the Society of the Plastics Industry. Production in December was 321 million lb, a drop of more than 30% from December the year before. Production in December 1981 also was 42.5% below production of 559 million lb in March 1981, which had the highest production of any month last year.

For the full year, production of PVC was up slightly from 1980. Output last year totaled 5.7 billion lb, an increase of 4.3% over 1980. Shipments of PVC, however, moved up more slowly, rising 3.9% to 5.6 billion lb from 1980.

It would be easy to blame the construction recession for PVC's problems and to a certain extent it is true that the poor housing market has pulled down PVC use over the past two years. But, in 1981, demand for PVC pipe, which is an area affected largely by construction and which accounts for about 38% of PVC resin demand, actually improved more than most other PVC end uses. Though shipments of PVC resin increased only 3.6% last year over 1980, pipe use of PVC resin rose 9% to 2.03 billion lb from 1980.

PVC production growth trailed that for all thermoplastics. Thermoplastics production increased 5.2% in 1981. Shipments of thermoplastics increased just 3.0%, making PVC outperform the broader category.

The PVC situation for January improved somewhat, although some industry observers think the improvement may be simply inventory building along the line rather than any real upswing in demand. PVC demand in January increased 11.6% to 387 million lb from December's level. Production in January moved up 11.6% to 358 million lb from December. However, shipments are still 9.6% below where they were in January 1981, and production is off 21.7%. The result was that the capacity utilization rate for all of 1981 was about 73%, but this dropped to about 50% in December.

Since there is so much PVC capacity available, the price for the thermoplastic has plummeted. Although the list price is nominally above 30 cents per lb for the resin, a more realistic price is about 24 cents per lb, and there are reports that prudent shopping can secure PVC for 20 cents per lb or less.

Producers say the only thing saving them on price is the heavily discounted prices of their raw materials. Chlorine's price is steeply cut from its posted $145 to $150 f.o.b. and industry sources say that ethylene is going for as little as 17 cents per lb, down drastically from its list of a little more than 24.5 cents per lb.

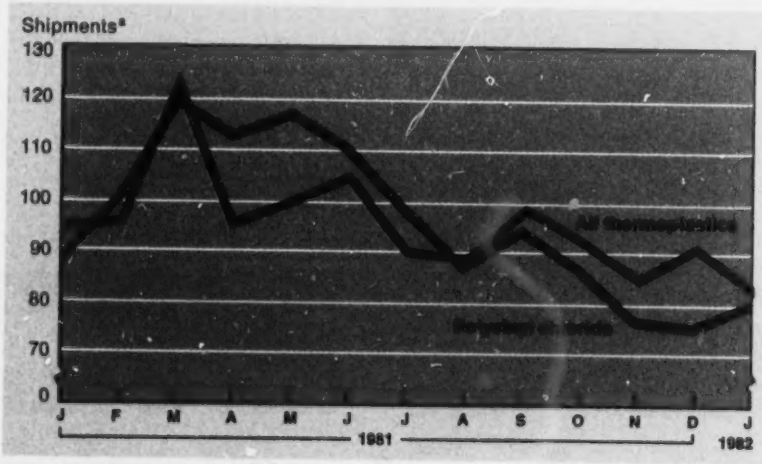
With operating rates as low as 50%, it is almost axiomatic that there is production capacity that is shut down, although no one is sure just where or just how much. It is known, however, that Air Products has closed a plant, as has Pantasote, a small factor in the PVC business.

With the industry in such a shambles, it is no wonder that some producers are quite definite about getting out of the business. The latest of these was Stauffer Chemical, which sold its Delaware City, Del., plant to Formosa Plastics last year, and this year was forced to scrap its Long Beach, Calif., plant when the company could not find a buyer (C&EN, March 22, page 10). Other companies with operations on the block include Air Products, Diamond Shamrock, Pantasote, and Tenneco.

The Tenneco situation is an example of the problems involved in selling PVC operations today. It has been reported widely that the company's chemical operations are for sale, but company insiders say that the PVC business is one of the factors hindering its sale. One prospective buyer is balking at the price that Tenneco wants for its PVC operations; another company says that it will buy the chemical business, but under no circumstances does it want Tenneco's PVC plants.

William Storck, New York

PVC led other thermoplastics part of last year



a January 1980 shipment level = 100. **Source:** Society of the Plastics Industry

Growth slows for alcohols as octane boosters

Use of alcohols and an ether as octane boosters in gasoline continues to grow. This is in spite of numerous reports of the termination of ethanol-gasoline marketing programs and cancellations of some plans to build plants to make these oxygenated compounds. But it is clear that the growth falls well short of that forecast in 1980, when gasoline apparently was in short supply.

Granted, changing economics in the petroleum refining and natural gas industries may accelerate use of these octane boosters. Other changes, however, may slow growth. Deregulation of natural gas prices or a worldwide crimp on the supply of crude oil could change use faster than economics.

Fuel uses, if they develop to the extent that some observers are forecasting, could dwarf chemical uses. For example, if gasoline consumption averages 6.25 million bbl per day and ethanol content averages 1%, about 1 billion gal per year would be needed for this use.

Currently, industry sources estimate that about 75 million gal of gasoline per month, up from about 55 million gal per month at this time last year, are being sold containing 10% ethanol. Total consumption of ethanol in gasoline in 1982 may reach 100 million gal, almost all of it made by fermentation.

Current consumption of ethanol, methanol, *tert*-butyl alcohol (TBA), and methyl *tert*-butyl ether (MTBE) as octane value improvers in gasoline still is relatively small if compared to the potential for use of these materials. Cost figures provided by advocates of these oxygenates offer incentive for their use. But some refiners emphasize that their value depends on individual circumstances and how individual refiners calculate their economics. For example, as long as toluene demand remains low for nongasoline uses such as dealkylation to benzene, refiners will tend to use toluene and other aromatics in catalytic reformates to get what they think is needed for gasoline octane values.

The scheduled October 1982 further phasedown of the use of lead alkyls as octane improvers—one of the lowest-cost additives—could increase the burden on small refiners by increasing their costs for octane value. The importance of their plight to the refining industry is comparatively small but probably critical to their continued operation.

From this analysis of the use of ethanol in gasoline—the combination now more likely to be called "superunleaded with ethanol"—Daniel C. Greer, vice president at Ashland Development, concludes that ethanol consumption will continue to rise as new fermentation plants, mostly in the Midwest, come on stream. Economics are such, he told the 80th annual meeting of the National Petroleum Refiners Association, that ethanol needs just the 4 cents per gal federal excise tax exemption to be competitive with either MTBE or toluene in terms of cost and octane improvement.

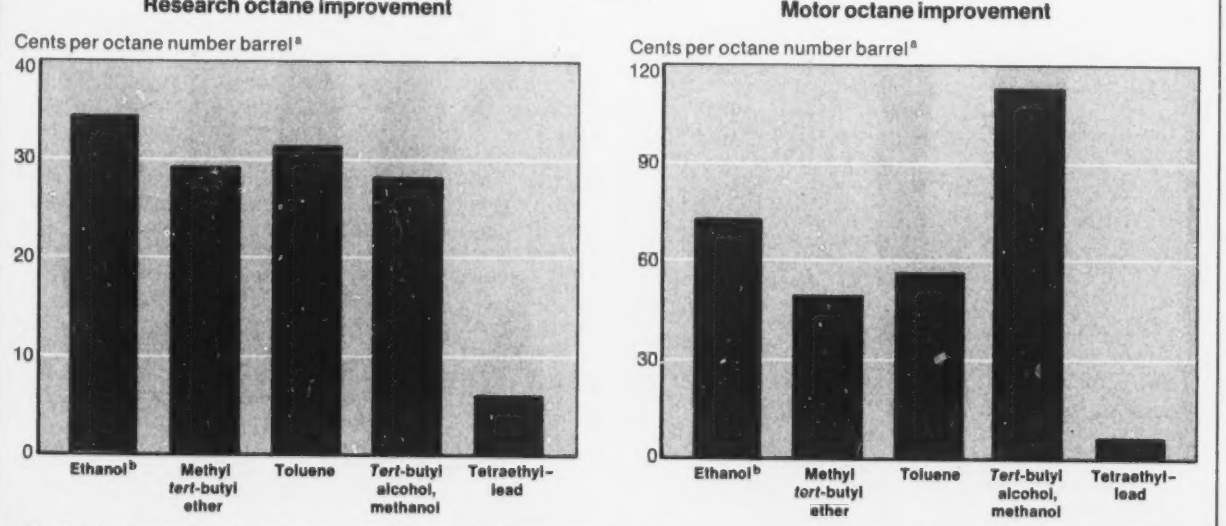
Similarly, Edward G. Guetens Jr., business manager, octane components at Arco Chemical, told the meeting that he estimates that the 9.5% volume level in lead-free gasoline of the company's blend of methanol and TBA, trademarked Oxinol, can give a 15 cent-per-gal incentive to refiners.

Recently the Environmental Protection Agency granted a waiver allowing an increase in concentration from 5.5%. The incentive, according to Arco Chemical, exists without tax credits or other incentives and despite slowing demand for gasoline.

The higher concentration of these oxygenates gives a lower blending vapor pressure for gasolines, according to Guetens. This reduces the penalty resulting from lowered use of butane in gasoline to hold down the vapor pressure.

Methanol, too, has economic advantages as an octane booster, but concerns exist over handling and materials compatibility problems, says William A. Rains, executive vice president of Roger Williams Technical & Economic Services. Because of methanol's current low cost, some will be used in gasoline illegally unless government authorities crack down on its use or until EPA regulations are changed to permit its use without a cosolvent or other additives. □

Octane enhancers vary in cost effectiveness

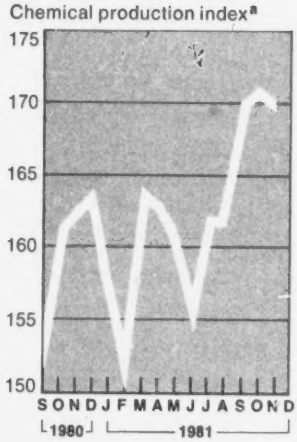


a Cost to raise octane number of a barrel of gasoline (42 gal) by 1. b Without tax exemption or vapor-pressure standard exemption. **Source:** Ashland Development Inc.

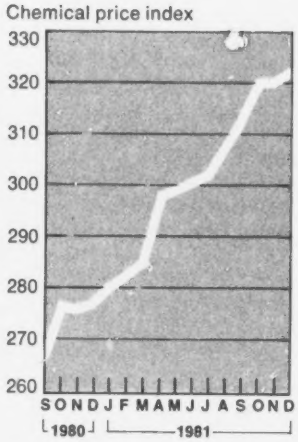
Statistics confirm Europe's slump in 1981

France

Chemical production index[a]

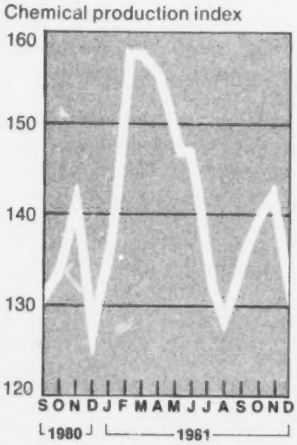


Chemical price index

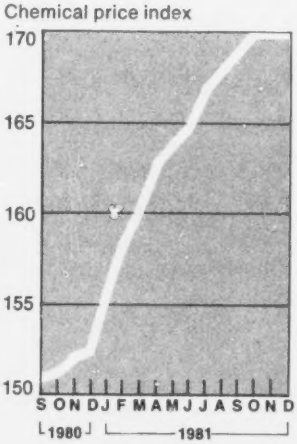


West Germany

Chemical production index

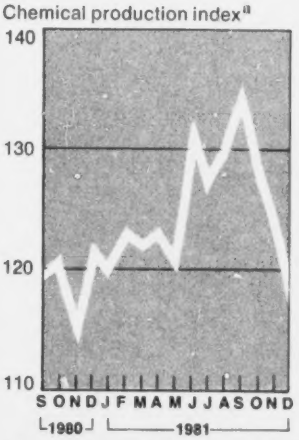


Chemical price index

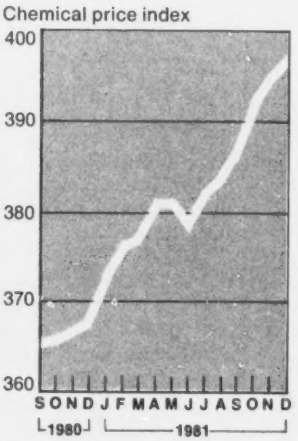


U.K.

Chemical production index[a]



Chemical price index



a Seasonally adjusted. **Note:** Base year for all indexes is 1970 = 100.

That the chemical industry in Western Europe fared poorly last year hardly is news anymore. But statistics now appearing lend official support to what key executives have been saying in recent weeks.

In France, the average monthly production index value for the 11 months January through November (December's figure was not available at press time) was 162.6 (1970 = 100). That is an improvement of less than 1% over the 1980 average during the like period, and 0.5% under 1979's. West Germany did slightly better with a 1.6% advance in the 1981 monthly production index average to 143.0 (1970 = 100) compared to 1980. Nevertheless, last year's average was 2.3% down from 1979's. In the U.K., the 1981 monthly average of 125.5 (1970 = 100) was almost 1% under that of 1980, and 9.3% off from 1979.

The price index profile for 1981 is more encouraging. In France, the monthly average for the full year was 302.9 (1970 = 100), up 14.2% from 1980, and not far off from the 19.0% gain in 1980 on 1979. In West Germany, the 8.6% advance to 165.1 (1970 = 100) just about matched the 8.0% improvement of 1980 over 1979. But for the U.K., there was a definite slackening in the rate of rise. Last year's monthly average increase of 6.4% to 383.6 (1970 = 100) was less than half 1980's 15.8%.

Producers' reactions to the price index rises are lukewarm. They point out that inflationary pressures on their across-the-board costs cut deeply into what gains were made. They also reason that the apparent increases mask the weaker segments of their business, such as bulk petrochemicals, where intense competition both inside and outside Europe has been keeping a lid on prices.

The same argument holds for the positive production index readings last year in France and West Germany. Ethylene output in France, for instance, fell 10% from the 1980 level to 4.09 billion lb, with crackers running at about 66% of their designed capacity levels. High-density polyethylene production was off 19% to 422 million lb, low-density polyethylene 16% to 1.52 billion lb. (Polypropylene proved the exception with output at 653 million lb, 41% ahead of 1980.)

It's not surprising that a low key is being struck on chemical investments. Last year saw a fall of some 30% in France from 1980. A further decrease of 5% is expected this year. A decrease is likely, too, in West Germany from last year's $3 billion total. Herbert Grünewald, president of the Chemical Industry Association there, predicts some 42% of this year's funding will go toward closing and replacing older units. About 36% will be spent on rationalization measures within the industry. The 22% balance will be channeled into plant expansions.

Estimates just released by the U.K. Chemical Industries Association put 1982 investment spending 7.4% ahead of last year's $2.35 billion ($1.00 = 0.5216 pound on Dec. 31, 1981) taking inflation into account. Rises foreseen for 1982, 1983, and 1984 include a hefty 23% going toward nuclear fuel treatment plants. Discounting this, and the effect of inflation, spending by the U.K. chemical industry in "real terms" is seen to rise a mere 1% this year, followed by a fall of 3% in 1983, and of 10% in 1984.

Dermot O'Sullivan, London

Most patents continue to be in chemical field

Patent office study shows that 50 major chemical subclasses accounted for 52% of patent documents added in 1978–80 period

Chemicals continue to be the largest area of patent activity in the U.S., with more patent documents filed in the various chemical categories than in both other major disciplines combined, according to the Patent & Trademark Office. PTO also finds that foreign patent activity in the U.S. is slowing down after a large increase in the early 1970s.

Of the three patent disciplines—chemical, electrical, and mechanical—chemicals are far and away the largest. PTO reports that for the three years 1978 to 1980, the 50 major chemical subclasses collected 14,340 documents, 52% of the total patents added for that period, compared to 29% of the total from electrical and just 19% from mechanical subclasses. This apparent higher growth for chemicals stems partly from the chemical industry's predilection to patent any new technology and partly from the greater scope of many of the chemical subclasses.

As in previous analyses, the 50 major chemical subclasses list is dominated by two major categories of substances. Twenty-five subclasses fall into the large area of drugs and bioaffecting and body-treating compositions, and account for 56% of the total growth in chemical patents in the three-year period. Another nine subclasses cover carbon chemistry patents, comprising 16% of the total.

But aside from sheer numbers, the growth rates of chemical patents are different. In terms of per cent growth, only one drug-related subclass is among the 50 fastest growing chemical subclasses. PTO comments that although many new patents were filed, the actual growth of the drug subclasses is small for a field so large.

Carbon compound technologies is the group that dominates the growth rate list. Of the patent documents filed in this area, 37% involve organic compounds. Of these, eight involve synthetic resins. The others range from hydrogenation of carbon oxides to ketones containing heterogeneous ring systems. PTO adds that 10% of the subclasses on this list are for patents on photoelectric panels, a finding that indicates high activity in solar technology during the 1978–80 period.

Deciphering just what is happening in foreign patents originating in the U.S. is complicated. For its analysis, PTO included both patents from foreign resident inventors and U.S. patents assigned to U.S. enterprises owned or controlled by foreign companies. This way, PTO includes both technological activity of foreign countries and the foreign influence in the U.S. technology market.

Four fifths of the foreign patents held in the U.S. come from the U.K., Canada, and the Netherlands, with an increasing share coming from Japan. To simplify its analysis, PTO took the five top European and the five top Japanese companies and studied their patent activity from 1969 to 1980.

The share of U.S. patent activity by these 10 firms increased from 3% in 1969 to a peak of 5.8% in 1976, and fell to 5.5% for 1980. The total number of patents is falling also. In 1980, for example, just 3160, or 16% fewer, patents were filed by these nations than in 1979. According to PTO, this could mean lower technological activity in these companies leading to patents, or simply less interest in filing U.S. patents for their inventions.

The report notes that there is a sharp division between the kinds of technology these firms patent. The five Japanese companies hold most of the foreign patents in electrical, computer, and photography subclasses, but they are almost inactive in the areas of chemicals and drugs, where the European firms really dominate.

PTO's report, "Technology Assessment & Forecast, Tenth Report," can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. □

Drug categories dominate in sheer number of patents . . .

Subclass	1978–80 patents	% growth	% Foreign share	Total patents
Drugs and bioaffecting compositions with active ingredient with a five-membered ring having one nitrogen atom	639	46.5%	46.6%	3380
Drugs and bioaffecting compositions with active ingredient piperidine or derivative thereof	562	38.8	51.6	3462
Drugs and bioaffecting compositions where active ingredient has six-membered heterocyclic ring of four carbons and two nitrogens	525	38.1	55.8	3075
Analytical processes for biological systems with combinations of tests or measurements with methods of regulating a reaction	505	53.0	28.7	1593

. . . but carbon chemistry patents show largest growth rates

Miscellaneous thermolytic distillation processes	38	88.4%	68.4%	83
Synthetic resins from mixture containing solid polymer derived from aldehyde or derivative as sole reactant with no more than one methylol group	31	83.8	45.2	117
Synthetic resins from 1,2-epoxy containing reactant; a phenol, phenol ether, or inorganic phenolate; and a nitrogen-containing alcohol or ether	34	82.9	26.5	117
Hydrogenation of carbon oxides using an iron, cobalt, or nickel catalyst	60	82.2	18.3	77

NOTE

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